

Infrastructure – a sensible investment?

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Introduction and conclusions

1. This paper has been prepared by a working party which has been looking into the suitability of infrastructure as an investment for financial institutions. The principal considerations which potential investors will wish to take into account are discussed, including the risks involved and the returns which can be expected. It is, however, only an introduction to a very complex subject, and there are pointers to some further reading. The main conclusions we have reached are as follows:

- The world needs massive extra investment in infrastructure over the next 15 years. It will be natural for institutions to participate in this investment, given their role and function in society.
- Investing institutions may have some opportunities to make relatively good returns if they are willing to follow the methods of infrastructure investment which bear the higher risks.
- The risks could be significant and due diligence is needed.
- However, there is currently a shortage of investable projects, with a resulting downward pressure on rates of return.
- Infrastructure investments offer institutions stable cash flows for many years, sometimes with links to inflation. The capital values of the investments may be less volatile than other categories of investment, which may help to make valuations of an institution's total portfolio more stable.
- Investments in infrastructure bonds are not risk-free unless there are watertight guarantees from credit-worthy governments.
- The highest risks and potential returns are likely to come from direct ownership of infrastructure assets (freehold or leasehold), or from the "equity" component of a structured financing package for new infrastructure. However, the risks are sometimes significant and hidden, and considerable due diligence is needed before authorising an investment. The work involved is costly but can be shared out between institutions which use common investment platforms. These platforms also have the advantage of enabling institutions to invest in more projects, thereby getting a better distribution of risk. The greatest risks usually arise when investments are made before construction has commenced, and some institutions may prefer to wait until construction is finished and the asset is in operation. Ownership may provide further development opportunities to enhance returns. The position of the investor is somewhat similar to that of investors in commercial property. Investors may need to work closely with planners and other parties to find suitable investment opportunities.
- Infrastructure funds have additional risks (such as those resulting from gearing) and usually shorter timescales, and may therefore not meet the needs of many institutions.
- The shares of listed utility and infrastructure companies offer a quick and easy route into infrastructure exposure but possess too many of the characteristics of equities in general to be seen as a significant diversification from those equities.
- Regulatory requirements are currently a less important obstacle to institutional investment in infrastructure than the shortage of suitable investments, but the regulatory position needs to be clarified for the future.

Scope of this paper

2. By “infrastructure” we mean all the fixed assets which can be deployed for economic benefit, whether they give rise to a revenue stream once operational or not. Many of these assets require very substantial initial investment and are undertaken by public sector sponsors, but some are undertaken by companies listed on the Stock Exchange, while others are financed by private equity and private debt. For a large project the finance for the initial investment can be raised in a variety of ways, including: bonds; inflation-linked bonds; development companies backed by banks; specialist infrastructure funds financed by investors; sale of a freehold or leasehold interest; and equity finance raised from investing institutions. Some projects are financed from just one of these sources, but others have a structure in which tranches of the investment are financed by investors who are willing to accept different degrees and types of risk. Some of the areas of economic activity in which new infrastructure is often required include transport, energy and power, communications, water, waste disposal, housing, and commercial property such as shops, offices and warehouses. This last category is one with which many institutional investors are already familiar, and some of them have large commercial property portfolios, spread over a number of individual assets. Some infrastructure projects in future may be proposed with the aim of making communities more able to withstand climate changes, for example through flood protection schemes. In other cases the aims of public sponsors of new infrastructure will often be to stimulate economic growth in a particular geographical area. On the other hand, the aims of investors will usually be to make a return which is sufficiently large to take account of the risks they have run. This paper discusses the tensions which can sometimes arise between these sometimes conflicting aims. It also considers the risks in some detail and the considerations investors might wish to think about when trying to balance risk and reward.

History

3. Much of the infrastructure in the UK has been financed from private sources. For example, in the 18th century many roads were impassable muddy tracks in winter and they were improved by trustees who borrowed money to lay down hard surfaces and then repaid the debt from the tolls charged to travellers. Georgian canal companies and Victorian railway companies financed some massive infrastructure projects, in the hope of making a good profit once their borrowings had been repaid. Docks, water and energy companies were also formed in the same way. Many of these companies were nationalised in the 1940s. More recently we have seen the privatisation of many utility companies, some of which have undertaken further big infrastructure schemes. Other forms of infrastructure, for example hospitals and schools, have been financed in the last 20 years through the Private Finance Initiative, with the aim of bringing in efficient private sector management of the initial construction and the eventual ongoing operation of the facilities. The Government has sometimes had to step in to encourage private investment to come forward, an example of which is provided by the multi-billion investment programme being undertaken by Network Rail since 2001, which is financed by bonds with a Government guarantee. In 2012 the Government set up a scheme to enable up to £40 billion of

other infrastructure to be financed by bonds with a Government guarantee, but so far projects worth only about £4 billion have been approved (reported comment by Treasury spokesman, April 2015). It is planned that £17 billion of the sum available under the scheme will be used to finance the rebuilding of the Hinkley Point C nuclear power station, but in April 2015 it was reported that there are now serious doubts about the quality of the steel which will be used to make a casing round the reactor. One of the advantages claimed for government guarantees is that they enable funds for public projects to be raised more cheaply than in other ways. Naturally the benefit of this will depend on the extent to which the market believes the guarantee can be relied upon for many years into the future, which will vary from one country to another.

Why institutions will consider infrastructure investment

4. Some of the reasons why financial institutions might wish to invest in infrastructure bonds or equity as part of their overall portfolio are:

- a. A possibly better return than on other investments;
- b. Stable and predictable cash flows during the operations phase;
- c. Returns on investments which are insensitive to fluctuations in business, interest rates and stock markets and have low correlations with the returns on other investments;
- d. Need to diversify in order to get a more stable return on the portfolio as a whole;
- e. Need to match long-term liabilities with long-term income streams;
- f. Requirement for a return which is inflation-linked over a long period (where applicable);
- g. Relatively high recovery rates, low default rates and good credit ratings; and
- h. Desire to enhance reputation by being seen to finance social infrastructure.

The hurdles include:

- Regulatory requirements for investors;
- Illiquidity of many infrastructure assets;
- Lack of transparency;
- Need for lengthy and costly due diligence;
- Poor availability of statistics of past performance;
- Fee levels for intermediaries;
- Lack of understanding of risks;
- Uncertainties which cannot be foreseen; and
- Difficulty of getting to the front of the queue for the best investments.

Potential investors will need to consider whether the returns on investment will be lower than has been the case historically and the extent to which investors are being rewarded for credit risk as well as liquidity risk. They will also need to consider whether the risk-reward balance on infrastructure is sufficiently attractive, in comparison with the risk-reward balance on other kinds of investment.

The need for more infrastructure

5. As economies grow, more infrastructure is always needed. How much investment is likely to be required globally? Is a funding gap likely? The expectation is that increased investment from insurance companies and pension funds may be needed, to fill the gaps which governments leave unfinanced. It is possible that, unless financial institutions in developed countries increase their readiness to invest in infrastructure, some of this money will not be found and world economic growth will be impeded. Perhaps the role of governments round the world will change, so that instead of investing in infrastructure directly themselves, they provide guarantees which will unlock greater flows of cash from institutional investors.

One of the underlying considerations is that substantial infrastructure will be required to transition to a low carbon economy and to assist with adaptation and resilience to climate change. Whilst the directly attributable effects of climate change are likely to be experienced in different regions in different time periods, many effects are likely to be experienced well before 30 years' time. The nature of infrastructure, in terms of the investment of financial capital, natural resources, time and human capital, means that the choices made now will have a substantial impact on whether and if so, when a transition to a low carbon, sustainable development path is followed.

It has been estimated that the world will require public infrastructure spending totalling US\$ 2.8 trillion per annum, i.e. about 3% of world GDP, over the 25 years between 2005 and 2030 [see OECD study *Global Infrastructure Needs to 2030*, page 54; http://www.keepeek.com/Digital-Asset-Management/oecd/economics/strategic-transport-infrastructure-needs-to-2030/global-infrastructure-needs-to-2030_9789264168626-4-en#page5]. About one quarter of this requirement is related to the distribution of water.

A more recent estimate comes in a PWC report [*Capital Project and Infrastructure Spending – Outlook to 2025*, based on research by Oxford Economics, apparently published in 2013.] This states that worldwide infrastructure spending will increase from \$4 trillion in 2012 to more than \$9 trillion per year by 2025, the growth being mainly accounted for by increased spending in China, Asia and emerging megacities. The differences between this figure and the OECD figure in the previous paragraph may be partly accounted for by different definitions of “infrastructure”, though this is unclear.

It is certainly theoretically possible that insurance companies and pension funds in OECD countries might be able to contribute a sizeable proportion of the total infrastructure investment required each year, since their assets totalled US\$ 44.5 trillion in 2011 [Source: OECD Working Paper No.36, *Institutional Investors and Infrastructure Financing*, 2013, page 8], but the question is whether they will decide to do so, given the risks and returns available.

The European Commission estimated in 2013 [http://europa.eu/rapid/press-release_MEMO-13-611_en.htm] that 1500 to 2000 billion euros would be required to finance infrastructure project needs in Europe up to 2020. This equates to about 250 billion euros per annum. They stated that it was difficult to assess how big the investment market

was at the moment, because it was so fragmented, but it was possible to make some estimates - infrastructure transaction volumes had been stable at between 100 and 150 billion euros each year since 2007, indicating a consistent demand for financing.

In the UK there is a widespread recognition that more and better infrastructure is highly desirable, to replace worn-out structures, meet new emissions targets, provide resilience in the face of uncertainties, and satisfy the numerous needs of a growing population which also contains more children and older people. There is a feeling that changes are required in order to identify needs and suitable projects more systematically, and to achieve results within acceptable costs and timescales. The Armitage review is proposing an independent National Infrastructure Commission (NIC) to look 25-30 years ahead at the UK's infrastructure needs and to recommend a clear pipeline of projects with priorities (for example, flood protection and energy supply). Following a Parliamentary vote on the priorities, the Government would formulate detailed 10-year sector plans, and the NIC would report annually on their delivery. These arrangements would replace the current system where Infrastructure UK sits as a unit within HM Treasury.

Over 60% of world infrastructure investment in 2011 was attributed to Western Europe and the USA, although this is expected to decrease as emerging rapid growth markets take a larger share: as a result of higher expected growth rates, these markets' relative share in global infrastructure spending is expected to increase from current levels, financed at least partly by an increased rate of insurance and pension savings by the populations of those countries. One key question is whether local sources of finance will suffice to meet infrastructure needs in those countries or whether contributions will also be needed from financial institutions situated in countries which are already well developed.

Developing countries now spend about US\$ 1 trillion a year on infrastructure, but maintaining current growth rates and meeting future demands would require investment of at least an estimated additional US\$ 1 trillion a year through to 2020. [World Bank Press Release, 9 October 2014]. The World Bank has emphasised the need not just to increase the quantity of infrastructure but also to focus on its quality. Private infrastructure investment in emerging markets and developing economies dropped from US\$ 186 billion in 2012 to US\$ 150 billion in 2013. The Bank said that the real challenge is not a matter of money but a lack of bankable projects. In addition, of course, there is a continued need for infrastructure investment in economies which are already developed, though here too there is currently a shortage of investable projects. However, many of the potential investors are not yet ready to take the plunge, even if sufficient numbers of suitable projects were to become available. At present the majority of institutions' infrastructure investments consist of low-risk and very low yielding bonds which have either a Government guarantee or a high credit-rating, and it is unclear whether institutions will wish to venture out into other forms of infrastructure finance in order to increase yields, where this involves extra risk.

Current infrastructure investments (statistics)

6. Statistics are available of the infrastructure currently held by investors:

Investors with assets under management of over \$1 billion. OECD investors held USD 70 trillion in 2013 in long-term investments [Long-term financing of the European economy, European Commission, 2013] backing assets with a life spanning 25 to 60 years, generally in infrastructure. Institutional investors currently invest an average of roughly 3% of their total assets in infrastructure financing. Of 170 Europe-based private-sector pension funds investing in the infrastructure asset class, the top 25 funds, by allocation to infrastructure, have aggregate assets under management of more than €392bn. On average, these top 25 private sector pension funds have a current allocation to the asset class of 3.5%, lower than their average target allocation of 5%. With regard to how these investors allocate to infrastructure, 14 of the top 25 Europe-based private sector pension funds have established separate infrastructure allocations, while two invest through a general alternatives allocation. The remaining six investors invest in the asset class through part of a real assets or private equity allocation, part of an opportunistic investments allocation, or other types of allocation. For future investments, the funds will consider different routes to market, although all 25 of the top private sector pension funds favour investment via unlisted funds. 21% will consider investing in infrastructure assets directly, and 8% will do so via listed funds. Direct investors in the infrastructure asset class have an average of \$66bn in total assets under management [Prequin, Jan. 2015].

Investors with assets under management of less than \$1 billion. 301 smaller institutional investors, with AUM under US\$1bn, have aggregate assets under management of US\$ 125bn, and allocate an average 5% of total assets to infrastructure, which is below their target allocation of 7%. These investors' allocations are distributed between four main types: part of real estate allocation (43%), part of private equity allocation (25%), separate infrastructure allocation (19%), part of general alternatives allocation (8%), other (4%). Of the separate infrastructure allocation, unlisted funds are the favoured way to access the market, and only 7% of these smaller investors utilize direct investments.

Infrastructure funds. Entering Q1 2015, 454 infrastructure fund managers globally are on the road looking to raise an aggregate target of US\$ 102bn from institutional investors [Prequin]. This includes both direct and indirect primary funds offering both debt and equity participation. In 2014, US firms maintained their lead in terms of capital formation, raising a total of \$50.44 billion, with Australia following closely behind with \$47.32 billion. Europe is a distant third, accounting for \$21.32 billion – with France the leading country accounting for almost \$10 billion – followed by Asia with a total of \$9.58 billion. Though these figures are impressive, it is clear that infrastructure funds currently contribute a relatively small proportion of global infrastructure spending.

Risk-bearing investments by institutions

7. This section gives details of some of the known risk-bearing infrastructure activity by financial institutions but does not purport to be fully comprehensive. It excludes investment in commercial property, which is a form of infrastructure investment that many pension funds and insurance companies have undertaken for many years on a risk-bearing basis.

Some of the ways in which institutions have already funded infrastructure round the world are as follows:

i. Many Governments issue bonds to finance infrastructure construction. Where these bonds have a solid Government guarantee, the infrastructure connection is purely incidental and they are treated by institutions in much the same way as ordinary Government bonds in which they habitually invest. Sometimes projects are financed by a private loan arrangement with an institution.

ii. Australian and Canadian pension funds have been among the most active investors in infrastructure, both at home and overseas, with some having allocated 10% or more of their investment portfolio to infrastructure on an “equity” or risk-bearing basis. They have acquired the necessary knowledge and expertise and have in-house resources able to carry out research and risk-assessment of projects. They can co-invest with other parties, often from the public sector in a “public-private partnership” and they sometimes even take leading roles. They have been particularly active in energy assets.

iii. Until recently UK pension funds and insurance companies have not usually invested in infrastructure equity or ownership to any great extent, although one or two of the largest pension funds have dipped a toe into equity infrastructure opportunities – for example the Universities Superannuation Scheme bought Australia’s Brisbane Air Train Service for \$110m in 2013. Some pension funds may have small investments in specialist infrastructure funds, which increase the risks and returns by gearing and typically have a 10-year time horizon and large fees. There have been two important developments in the last 3 years:

- A new Pensions Infrastructure Platform (PIP) was established in 2012 by the National Association of Pension Funds to attract low-risk investment by pension funds in new roads, hospitals, airports, etc. The PIP will favour mature “brownfield” investments with a detailed history of use, including existing public-private partnerships, and is unlikely to consider new “greenfield” investments unless construction risk can be reduced. In November 2014 it was reported that the platform had so far committed close to £300 million, with a target of £2 billion.
- In 2013 insurance giants including Legal & General, Prudential, Aviva and Standard Life pledged £25 billion of UK infrastructure investment over a 5-year period as part of the government’s re-launched National Infrastructure Plan. It is known that Legal and General, for example, have invested in student accommodation, and have also been supportive of small projects with big local impacts. Aviva’s Investment Management arm has invested in domestic solar panels. However, there has been a shortage of long-dated investments which will match an insurance company’s liabilities. Rothesay Life announced in April 2015 that they were likely to cut back on planned investment in 2015 because not enough infrastructure investments had come forward under the UK Government Guarantee scheme (see paragraph 3).

iv. The infrastructure investment body Scottish Futures Trust has introduced the Hub model for smaller-scale public-private community infrastructure projects, under which public sector bodies form ‘hub companies’ with the private sector, as procurement vehicles for projects. A project can include contributions from multiple public bodies – for example, local authorities, health trusts, police and fire authorities – which will share use of the resulting facility. [*PMI News*, April 2015, page 37].

v. Pensions Insurance Corporation UK is a low-risk investor with £12 billion of assets. It is seeking long-dated infrastructure bonds with investment grade credits to match its liabilities, including bonds with inflation protection.

vi. OECD reports have concluded that European pension funds have only recently started building up their investments in infrastructure, with allocations ranging up to about 3% of their total portfolio. They usually prefer to invest in large, mature operating assets that already generate cash flow, without taking construction risks. However, there are signs that some of the largest European pension funds are starting to form joint platforms for infrastructure investment, somewhat along the lines of the UK’s PIP, and in particular are taking an interest in “green” projects.

vii. The National Pensions Reserve Fund of Ireland is seeking to leverage its 7 billion euros of assets to achieve Irish investments worth 21 billion, aimed towards stimulating national economic growth. The Fund is willing to come in at the start of the asset creation process, with higher risk. It is, however, willing to partner with pension funds requiring lower risks and will create appropriate structures to facilitate this.

viii. GIC Special Investments Pte of Singapore invest in the “equity” of infrastructure, as an arms-length manager for the Government of Singapore, anywhere in the world outside Singapore. Employing a team of about 20 people, they are willing to take a degree of risk and are seeking the best possible risk-adjusted returns.

ix. Public Private Partnership models have long been used in the UK for projects such as new hospitals and schools, where a private sector consortium constructs, equips and manages the building, in return for a rental paid by a local health trust or education authority which depends on availability of the facility and the achievement of quality standards. At the end of a predetermined period, such as 30 years, the ownership of the building reverts to the public sector. The extent to which such developments have been financed by institutions is unclear. In some cases the private investors may be able to identify opportunities to make extra returns, for example by letting out schools in the evenings or by designing in additional facilities such as shops. In some cases the deals have been criticised as giving too high a return to the private investors, so a new model has been developed by the Scottish Futures Trust for projects worth over £50m. This is known as the Non-Profit Distributing (NPD) model, which caps the returns available to investors [*PMI News*, April 2015, page 37], and apparently six deals have been closed so far. The model is being considered for the proposed £200 million Velindre specialist cancer centre in South Wales. In view of the cap on returns, it seems likely that such deals will only interest insurance companies and pension funds for tranches of finance where the risks are perceived as minimal.

x. Some investment managers offer investors a portfolio of listed infrastructure shares, e.g. water and energy companies.

xi. Banks have also been investors in infrastructure. Some reports suggest that this activity may be tending to decrease, because of new solvency requirements. Other reports say that bank lending for project finance increased in 2014, and that institutional investors are finding it challenging to match the speed and deal-flexibility which banks offer.

Regulatory requirements for institutions

8. At present regulation issues are less of a deterrent to infrastructure investment by insurance companies than the lack of supply of suitable infrastructure investments, which is pushing up prices and compressing yields. The regulations themselves are only really a strong barrier in the sense that, if the assets are being used for the Matching Adjustment to back annuities, then this may restrict the volume of eligible assets, just as it is an issue for other fixed income assets like corporate bonds etc. For non-Matching-Adjustment assets, although there is a feeling that capital charges may be higher than they should be, this is not stopping insurers from investing when they find assets carrying suitable risks and returns. However, the regulatory issues are to some extent creating a gap between the supply of infrastructure investments in the market and the particular requirements of insurance companies. Some insurers want long term infrastructure debt to match liabilities but may also require Spens clauses to obtain matching adjustment eligibility. This locks the infrastructure equity holder into a long term commitment, with arguably penal Spens clauses in the event that refinancing is required. [A Spens clause applies to UK listed bonds and provides protection to the investor, by ensuring that on an early termination of the bond the investor receives sufficient compensation to enable it to obtain the same cash-flows by re-investing in risk-free gilts.]

9. However, in the longer term there is a case for considering whether there should be special treatment for infrastructure investments in the regulatory framework. EIOPA (the European Insurance and Occupational Pensions Authority) has commenced a study:

- to develop a definition of infrastructure investments that offer predictable long-term cash-flows and whose risks can be properly identified, managed and monitored by insurers;
- to explore possible criteria for the new class of long-term high quality infrastructure assets covering issues such as standardisation and transparency; and
- to analyse the prudentially sound treatment of the identified investments within Solvency II, focusing on their specific risk profile.

[Source: EIOPA newsletter, February 2015].

10. EIOPA's initiative is consistent with the aims set out in a Green Paper, *Building a Capital Markets Union*, published by the European Commission on 18 February 2015, which states that the challenge is to unlock investment in Europe's companies and infrastructure. [http://ec.europa.eu/finance/consultations/2015/capital-markets-union/index_en.htm]. The stated need is to make the system for channelling investment funds – the investment chain – as efficient as possible, both nationally and across borders. The recently finalised European Long-Term Investment Funds (ELTIFs) regulatory framework may also help to make long-term investment in infrastructure easier. The European Commission believes that ELTIFs should have particular appeal to investors such as insurance companies or pension funds which need steady income streams or long term capital growth.

11. EIOPA launched a consultation on 27 March 2015 through their *Discussion Paper on Infrastructure Investments by Insurers* and are expected to publish a formal response to the European Commission by the end of June 2015. The paper asks what elements in the Solvency II framework might prevent insurers from investing in infrastructure, and discusses how these elements could be adapted while preserving the same level of policyholder protection. The paper points out that investments in infrastructure present potentially complex risks, which can also vary significantly between different types of infrastructure projects, and that there should be sufficient understanding of the assumptions upon which future performance or usage of the project, and thus payments to the financiers, are based. It also states that not only is a thorough due diligence process vital before deciding upon an investment, but such investments will also require active engagement to monitor their ongoing performance and suitability. The paper discusses how insurers should satisfy supervisory bodies that they are dealing adequately with such issues, perhaps by using an internal rating system. Is there scope for insurers to work together co-operatively in developing rating systems which will satisfy regulatory requirements? Will Matching Adjustment and hold-to-maturity restrictions limit future investment in infrastructure by insurers? Will social and political factors be given any weight in the decision as to whether a particular infrastructure investment is acceptable?

Risks in infrastructure projects

12. This section looks at the risks for investors in infrastructure projects. These risks will be considered under 6 main headings:

- Construction risks
- Forecasting risks
- Operating and revenue risks
- Guarantor credit risks
- Financing risks
- Other risks

Each heading will now be considered in turn, and the section concludes with some remarks on the risk consequences of illiquidity, the possibilities for risk mitigation, and the need for risk investigations and risk governance.

13. *Construction risks.* These are the risks which an investor bears if he takes ownership of land and constructs a physical infrastructure asset on it. To start with, there is the risk that planning permission may not be granted. Even once this has been obtained, the cost of the project may be hard to estimate. Because of the uncertainty of the issues which may arise during the construction process, it is sometimes difficult to forecast, even approximately, how much the eventual cost of construction will turn out to be. For example, the Edinburgh trams project was originally costed at £375m in 2003, but the budget was later increased to £545m. By June 2011 it was apparent that the project had gone seriously wrong and it was decided to cut out the eastern section of the line, but even so the eventual cost was over £770m for the reduced project. In many projects, however, construction costs come in quite close to the estimates made after the project plan has been completed but before construction commences. For example, two current projects – Crossrail and the Second Forth Crossing - are looking good in this respect, though in neither case is construction yet finished. There are also potentially expensive risks which may arise from social or environmental causes during the construction process, including deterioration of water quality over the surrounding area, and the possibility of delay and extra cost due to

opposition from special interest groups concerned with noise, landscape protection, preservation of historic buildings, etc.

14. *Forecasting risks.* If the investment is being made before the project comes into operation, there is always the possibility that some of the key forecasts which have been made about the period after construction is completed may turn out to be wide of the mark. These forecasts typically relate to usage of the new infrastructure, and the ongoing net revenues from it, after deducting operating, maintenance and renewal costs. These net revenues might turn out to have been very much over-estimated, either by accident, by the difficulty of predicting the future, or sometimes as the result of deliberate bias by those anxious to see the project proceed. As an example, at the time the decision was taken to build the Channel Tunnel (around 1985), 15.9 million passengers were predicted for the Eurostar trains in the opening year (1995), but the actual numbers were only about 2.9 million, rising to 7.1 million in 2000 and falling to 6.3 million in 2003. The completion of a high-speed connection on the British side (the Channel Tunnel Rail Link, from London) then caused Eurostar traffic to rise, but by 2014 there were still only 10.4 million passengers.

15. *Operating and revenue risks.* Once the infrastructure asset has been completed and a stream of net revenue has been established, an institution looking for a low-risk investment might be willing to purchase the revenue stream, perhaps on the basis of taking a 30-year lease. There will still be some remaining risks, however, and the investor will need to consider these very carefully. First, the gross revenues, if they derive from fares or charges based on actual usage, might be adversely affected in future in an economic recession or if competing infrastructure is built which results in reduced usage. Even if there is some comfort from a regulatory regime that guarantees fixed prices for a number of years (for example, for electricity generated by a wind park), there may be uncertainty about the revenue stream thereafter. For any kind of infrastructure, operating and maintenance costs might rise due to wage increases or new safety requirements introduced by regulators. It is possible that the revenue stream may be temporarily interrupted by severe weather, fire, earthquake or terrorism. Essential equipment might have to be replaced earlier than anticipated if it becomes prematurely worn out or obsolete. Faults may be discovered in the construction of the infrastructure, which require costly remedial action and enable only limited recourse (if any) against the contractors who built it. The EIOPA discussion paper (see paragraph 11) has an annex which discusses possible criteria for assessing revenue risk for the purpose of insurance regulations.

16. *Guarantor credit risks.* If the return to the investor is underwritten by a guarantee from a credit-worthy government or other third party, for example where an infrastructure bond has been issued, the operating and revenue risks referred to in paragraph 15 can be largely discounted, since the cost will fall on the guarantor. In some cases, however, the guarantee might have been issued by a subsidiary company which does not have automatic backing from a credit-worthy party and in such cases it may appear that little value can be placed on the guarantee.

17. *Financing risks.* The capital structure of some “private equity” funds which aim to own infrastructure may involve an element of gearing, where the fund borrows money in order to increase its infrastructure exposure and increase the expected return to fund participants. One risk here is that the borrowing might have to be rolled over during the fund’s lifetime at a higher rate of interest, leading to a diminution in the investors’ returns. Another risk for these infrastructure funds, which often have a life of 10 years or less, is that when the assets come to be sold at the time the fund is wound up, the prices achieved may be very much less than expected,

so that investors make a loss. If the prices achieved are very low, there might even be the risk that investors will have to put more money into the fund at that time in order to repay all the borrowings. Gearing may also exist in the capital structure of the financing arrangements for an infrastructure project, where the major part of the cost has been financed by issuing bonds and the remainder by issuing equity-type instruments, and the holders of the latter may experience very variable returns (in either direction).

18. *Other risks.*

- It cannot be sufficiently stressed that a major infrastructure project is often propelled forward by the intense efforts of a politician or senior official whose career depends on the project getting approval to go ahead. This may well lead to pressure to get the project approved before the costs have been fully evaluated and the risks properly assessed; moreover, the project may not be the optimum way of achieving the benefits envisaged because it has been selected too hastily. In some cases there may be hidden motives, such as seeking work for construction companies and creating jobs for workers. These factors could well lead to bias in the cost estimates for the project or in the estimated usage or ongoing costs, which will only become apparent at a later stage. Even after project approval there is a risk that there may be a change in the political situation of the country where the infrastructure exists, leading to the abandonment or major modification of the project while under construction or to new requirements being placed on the operators of existing infrastructure (for example the imposition of stricter rent control on residential accommodation or control of the fares which may be charged in a transport project).
- In the case of investment in infrastructure overseas, there are the risks of currency fluctuations, repatriation of money and sanctions. When the infrastructure reaches the end of its life, there is the risk that removal and clean-up may cost more than anticipated.
- There is sometimes a danger that an infrastructure project will give rise to significant hostile acts by parties who are adversely affected by it – an example would be the diversion of a river by a country through which it flows upstream, to the detriment of a country through which it flows downstream. There are also risks from terrorism or cyber attacks for other reasons.
- Given that many infrastructure investments will last for 30 years or more, it is necessary to consider the implications of likely climate changes, many of the effects of which are likely to be experienced long before the expiry of this period. These may well include an increased frequency of severe weather events, with consequences such as flooding, and the extent of the increase may be hard to quantify with confidence. In some cases higher temperatures may adversely affect usage, if the facility is not sufficiently adaptable, although in other locations the changes might actually be beneficial. In future it will be desirable for infrastructure to have a degree of flexibility and resilience built in, even at extra cost, so as to reduce the chance of costly repairs or even premature obsolescence due to climate change, as well as enabling it to recover quickly from any disruption caused by hostile interests.

19. *The risk consequences of illiquidity.* Many infrastructure investments are illiquid, in that it is difficult or impossible for the investor to sell their interest before the expiry of the period of time for which the contract runs. This may cause risks for the investor, if its own circumstances change before that point is reached and cash is needed prematurely, and (unlike many other kinds

of investment) it also has the effect of making it hard to walk away if any of the risks listed above show increasing signs of materialising.

20. *Risk mitigation.* If the investor is undertaking responsibility for the construction of the asset, as well as its eventual operation, it may be worth insisting on the use of a methodology such as RAMP (Risk Analysis and Management for Projects) to resolve uncertainties, help in the design of the asset, keep risks to a reasonable minimum and determine the cost-effectiveness of various risk-mitigation actions. If the contractor who is responsible for building the asset is willing to enter into a fixed-price contract, this will go a long way to reducing the construction risk for the investor, although even in a fixed-price contract there may be extra costs for the investor to bear if specification changes have to be made. It will be important to check that the contractor will be able to finance any cost over-runs himself without any risk of going bankrupt, since if the latter occurs and a new contractor has to be engaged, this will inevitably result in considerable delay and extra cost for the investor. Forecasts of net revenue streams can be checked to some extent against the outcome for similar projects elsewhere. An investor can avoid construction and forecasting risks by adopting a policy that no investment will be made until the asset is complete and a revenue stream has been established, even though this will reduce the expected return. Because of the somewhat unpredictable nature of future revenue streams depending on usage, some investors might prefer to invest in projects where a fixed revenue stream will be payable by a credit-worthy public body just because the asset is available for use: in such cases the main risks will relate to maintenance and renewals of equipment. Many of the other kinds of risk require a process of due diligence, differing from one investment to another, to tease out the exact nature of the risk and make some broad estimates of likelihood and impact. For some risks it may be possible to insist that they are borne by other parties or even insured (as in the case of fire, for example). Finally the documentation must be examined very carefully indeed to make sure that the investor is not inadvertently assuming unanticipated risks, which could cause the investment to have a zero or even negative value.

21. *Investigation of risks.* It will be apparent from the above discussion that the risks for investors in infrastructure projects can vary greatly from one situation to another. The highest risks will usually be borne by investors who come in at the very start of a project and are prepared to bear construction and forecasting risks, as well as the risks of operation and maintenance once construction is complete. These situations will also normally offer the highest potential returns, and sometimes these returns will be able to be enhanced by exploiting opportunities for additional development associated with the main infrastructure (for example, shopping centres associated with transport infrastructure). Potential investors in these situations will need to have a deep understanding of all the risks to which they will be exposed, though to some extent the risks can be spread by investing in a number of different projects. Concentration risk tends to be higher for infrastructure than for traditional equity or debt because of high unit sizes. For lower-risk investment opportunities, probably offering lower returns, whether of a bond or equity nature, there may still be hidden risks which need to be understood before investment is committed. The investigation of risks will always be a costly process, if it is done properly. One option for an investor who does not have his own specialised knowledge is to go into partnership with another investor who is committing his own money and will carry out a risk investigation on behalf of both parties. Platforms are being constructed which will enable like-minded pension fund investors to share the costs of risk investigations between them and to share in a number of different long-term investments in order to spread the risks.

22. *Risk Governance.* The risk governance surrounding infrastructure investment should cover the full lifecycle of the investment, from underwriting through to monitoring as well as possible impairment. Ultimately any qualitative investigation of risks may need to be converted into an internal rating in order to facilitate the selection of investments, the monitoring of risks and the setting of capital requirements. Investors are likely to need a risk investigation framework and internal rating system to ensure that projects are investigated and monitored consistently, perhaps using Key Performance Indicators and Key Risk Indicators. The heterogeneous nature of infrastructure investments, both in terms of the underlying project and the legal and financial structure, add to the challenge of comparing, rating and monitoring different infrastructure projects. Consideration will have to be given to what the investor would do to control any risks which materialised, including any refinancing options. What will the insurer do if an investment becomes impaired? For insurers with an Internal Model, infrastructure will need to be incorporated and this will require risk calibration; there will also need to be a feedback loop between the risk monitoring activities and the risk model, and new techniques may be needed to include infrastructure in models of Economic Capital.

Infrastructure bonds

23. Infrastructure bonds are bonds issued by various bodies to finance the construction of new infrastructure and because there is usually an element of risk, they normally offer a higher yield than government bonds. The key question for investors will always be whether the yield is sufficiently high to compensate for the risks involved, including any risks relating to the credit quality of the issuer.

An example of what can go wrong has been reported. The Castor project was a natural gas storage facility off the east coast of Spain. Work was financed by a 1.4 billion euros issue of 30-year 5.8% bonds by a consortium of European banks. After gas was first injected, earthquakes were detected in the area and work on the project was halted in 2013. The project was later abandoned. In this particular case the bond holders got their money back [Catalan News Agency 3 October 2014] because they were bailed out by the Spanish taxpayer, but it is easy to see that this might not have occurred had the contractual arrangements been worded differently.

It is important to note that the credit quality of the issuer needs to be investigated fully, and in particular whether the issuer may be a subsidiary body, the solvency of which is not fully guaranteed by a credit-worthy parent body.

Atlanta is a US city that has voted, in March 2015, to issue \$250 million of 30-year bonds to start to cope with a backlog of infrastructure projects costing four times that figure. About two-thirds of the money will be spent on transportation schemes, street resurfacing, etc. Much of the sum raised will be spent on projects of a city-wide nature but there will also be a large number of purely local schemes. Property tax revenues will be pledged as security for servicing the bonds. The bonds have not yet been issued but in January 2014 it was projected that the interest rate would be 5.4% per annum [Renew Atlanta 2015 Infrastructure Bond web-site, FAQs]. The return to investors, if this is the interest rate decided upon and all goes well, will clearly be significantly higher than the 3% per annum currently obtainable for an investment in US government 30-year bonds. No doubt potential investors, or ratings agencies on their behalf, will be doing due diligence on the prospects for the city's property tax revenues over the next 30

years, taking into account the likelihood that the infrastructure projects themselves may improve those prospects. They will want to investigate also whether there will be any prior or *pari passu* claims on those tax revenues for other purposes.

The municipal bond market in the UK is still in its infancy, but the first bond issue on behalf of the Municipal Bond Agency, covering a number of local authorities, is due to come to market in the next few months [*Professional Pensions*, 26 March 2015, page 27]. The motivation is to reduce the cost of borrowed money below the current margin of 100 basis points over gilts charged by the Public Works Loans Board, where local authorities borrow 75% of their money at present. It is not yet known how far the proceeds of the bonds will be used to finance new local infrastructure projects, and how much of the money raised will be used for other purposes. Whether the return on the bonds will be sufficient to attract institutional investors, given the risks, is currently uncertain.

Where infrastructure bonds have a watertight guarantee by central government, the considerations for investors are likely to be very much the same as for bonds actually issued by that government. There may be a slight improvement in the rate of return, if there are liquidity issues.

Unlisted Infrastructure Funds

24. One of the practical ways in which institutions can invest in infrastructure is through unlisted infrastructure funds, which offer the prospect of a significantly higher rate of return than infrastructure bonds, with different risk and duration characteristics. Although fees are high, the due diligence on individual assets is undertaken by the fund's management and the investor does not need its own dedicated resource specialising in infrastructure. Many of the funds last for only about 10 years, the intention being to sell the assets on to other parties in due course, so this is not a long-term investment. There is usually a lack of liquidity before the fund is wound up. In one way the risk is reduced, since the funds typically have a number of assets in their portfolio, which offers diversification of risk. However, the risk is increased in other ways because of the significant factors referred to in paragraph 17, as well as the currency risks if some of the assets are located overseas.

The choice of suitable funds in which to invest is a non-trivial task, since it is necessary to try to get a clear picture of the nature and extent of the risks which the fund will be running, and in particular any construction or forecasting risks, or "key-man" risks in the fund's management team. An important issue will be whether the aims of the management team are aligned with those of the investors because the managers have their own money in the business.

Direct ownership (freehold or leasehold)

25. Direct ownership of an infrastructure asset, either freehold or leasehold, is in some respects similar to owning a commercial property. There are, however, some extra risks and in addition the opportunity to sell a commercial property does not usually exist in the case of infrastructure. These direct unleveraged investments in infrastructure arguably have some of the characteristics of debt in terms of the stability of cash flows and some of the characteristics of equity in terms of open-ended risks and upside potential. The capital treatment of a direct investment is unclear under the Standard Formula but may be no better than an equity investment, creating an incentive to restructure the asset.

26. The first case to consider is where the investor is willing to buy the land on which an infrastructure asset is to be constructed. He might be willing to bear the cost of construction himself, perhaps engaging a contractor on a fixed-price contract. Once construction is complete he will then be responsible for the operation and maintenance of the infrastructure, probably offering contracts for these tasks to specialist operators and maintenance companies, and he will get a revenue stream depending on usage and charges. This type of investment is where the risks and the potential returns are likely to be highest.

27. If the investor does not currently own the land, and wishes to commit to the opportunity but avoid construction and forecasting risks, he might be willing to give an advance commitment that at some future date, when the asset is finished and a short period of successful operation has been completed, a long lease of the asset will be purchased at a predetermined multiple of the net revenue stream that has been established. There is a precedent for this in the town centre shopping malls constructed in the UK in the 1970s, where pension funds would guarantee before construction started that when the asset was 85% let they would buy out the investment on a long lease at a predetermined multiple of the rents achieved. An example where transport infrastructure was purchased by investors after the asset was complete is provided by the Channel Tunnel Rail Link, where two Canadian Pension Funds bought it on a 30-year lease for £2.1 billion in 2010, contracting track management, maintenance and renewal to Network Rail (though in this case there was no pre-commitment).

28. It may be that the investor would prefer to invest in property associated with the new infrastructure, rather than in the infrastructure itself. For example, in the case of a new transport link, there will often be opportunities to build shopping centres at principal stations. These investments will share many of the characteristics of normal commercial property investment, though there may be additional risks associated with usage of the infrastructure on which they are centred.

29. As an example, a large Malaysian pension fund provided the capital to buy London's disused Battersea Power Station, which will be developed by two commercial companies in partnership with the pension fund. This consortium is making an up-front capital payment to finance part of the cost of constructing the Northern Line Extension, a new underground railway which will serve the developed properties on the Power Station site and in the surrounding area. It is expected that the new railway will stimulate the development of other properties in the surrounding area, and pension funds will have the opportunity, alongside developers and other investors, to participate in those developments through the normal commercial property market.

30. Other types of freehold or long leasehold investment which are available include energy installations, residential property (buy to let), student accommodation, and private finance initiatives (hospitals, schools, prisons, etc). Each of these will have its own risk characteristics, and much will depend on whether the investor has to bear construction and forecasting risks. In many cases the return will depend on actual net receipts from the infrastructure once it is in operation, but for some types of infrastructure it may not be practicable to generate a flow of income and in these cases a shadow toll depending on usage or availability may be payable by a government body. These shadow tolls may have an inflation linkage built in, which could be attractive to long-term investors who have inflation-linked liabilities.

31. Investment into the energy sector, and notably renewable energy assets, has seen interest by institutional investors. Examples include investments through project loans, bonds or equity participation. For example, an onshore windfarm was commissioned in Jädraås, Sweden in 2013, at a capital cost of €360m. Of this, €120m is provided by Pension Denmark in the form of 15-year synthetic loans with a guarantee by the Kingdom of Denmark. The internal rate of return on the equity element is projected as 13.7%-17.7% p.a. after tax. [Article by Theresa Ruhayel, *The Actuary*, September 2014]

32. Residential property is a form of infrastructure which UK pension funds have tended to avoid in the past, partly because of concerns about possible rent controls and partly because of the reputation risks which might arise if the pension fund is perceived to be managing the properties in ways which impact harshly on tenants. However, many of these risks could be mitigated by using an intermediary management organisation. Many private individuals have found “buy to let” to be a worthwhile investment and there seems to be no reason why pension funds and insurance companies should not do likewise. In fact, as reported elsewhere in this paper, insurance companies are already investing in student accommodation. The construction risks can be largely avoided through fixed-price contracts. The rent control risk cannot be entirely ignored, since such controls were proposed by the Labour Party prior to the 2015 general election. Nevertheless it seems likely that residential property will become an increasing focus for institutional investors, as they seek higher returns than can be obtained elsewhere. The gap between available housing and the accommodation needs of the British population looks likely to continue for many years, even if the rate of construction increases, so rents are unlikely to decline and may even increase in real terms after allowing for inflation.

33. While UK financial institutions are likely to continue for a while to have only limited interest in investing (other than through bonds) in forms of infrastructure new to them, as they gradually acquire more experience their rate of investment in direct infrastructure ownership will probably rise as they seek higher returns and diversification of risk in their overall investment portfolios. They are likely to develop partnerships with other investors, and will seek to discover exciting investment opportunities by forming close contacts with public officials who may be seeking investment in projects they are developing. They will also develop partnerships with developers, as the Malaysian pension fund did in the case of Battersea Power Station (see above). Another partnership example is provided by Dutch pension fund asset manager APG, which in 2012 participated, alongside other parties, in a private equity fund focused exclusively on Philippine infrastructure projects. It was announced that the fund will target 5 to 10 investments of between \$50 million and \$125 million each, generating “attractive risk-adjusted returns” for pension funds in the Netherlands.

34. One particular form of direct ownership is the holding of equity in a project where much of the cost has been financed by an issue of debt. In this case the return to the investor will be geared and the investor will need to consider the risks involved carefully.

35. Institutions which have investment tax privileges, such as UK pension funds, will need to structure their direct ownership of infrastructure in such a way that they are not deemed to be trading and hence liable to tax.

Listed infrastructure equities

36. Introduction

Listed infrastructure equity arguably provides an alternative method of gaining exposure to infrastructure assets. Exposures can be gained either through listed infrastructure players (companies which own, operate, manage or maintain physical infrastructure assets such as utilities, transportation, energy and telecommunications companies), or through investment companies that invest in securities issued by infrastructure Special Purpose Vehicles (SPVs).

Liquidity is one of the most attractive features because institutional investors can gain immediate access to infrastructure, rather than waiting for years to strike a deal. A listed infrastructure portfolio is easily re-adjusted according to the market conditions and institutional investors can divest at their own timing. Exposure to infrastructure can be achieved at lower cost, and even offer better diversification across different sectors and geographical regions, which cannot be obtained by small institutional investors in unlisted infrastructure funds. Institutional investors will also benefit from daily pricing information and detailed financial reporting of these listed companies.

However, it is very likely that infrastructure equities are already in the institutional investor's existing equity portfolio and the extent of those holdings would have to be taken into account in deciding on how much extra should be invested in order to get the total exposure required. Listed infrastructure equities can be impacted by equity market sentiments unrelated to infrastructure performance, which limit the diversification benefit that infrastructure investment is meant to provide in the first place. Academic literature has provided evidence of listed infrastructure equities being an inappropriate proxy for infrastructure investment. Listed infrastructure equities exhibit high volatility, high correlation with business cycles, low alpha, and limited downside and inflation protection – characteristics that do not represent those of infrastructure investment.

37. Pure infrastructure players

Pure infrastructure players consist of transportation, utilities, telecommunications and social companies (as categorised by GICS classification or other) and also companies outside these sectors which are direct beneficiaries of infrastructure activities (such as companies involved in shipping, building materials, power generation etc.) .

Five major infrastructure indices are reviewed below and compared with an index of global equities as a whole – MSCI ACWI Infrastructure, S&P Global Infrastructure REIT, Macquarie Global Infrastructure, UBS World Infrastructure & Utilities, and Dow Jones Brookfield Global Infrastructure. All these indices use a sector-based approach in filtering their constituents, except Dow Jones Brookfield Global Infrastructure, which only considers companies that derive at least 70% of their cash flows from infrastructure activities. It is important to note that these indices are market-cap weighted and are particularly dominated by US

companies and the utilities sector. Therefore, these indices may not represent the general infrastructure market, but rather that of the utilities sector.

Investment performance

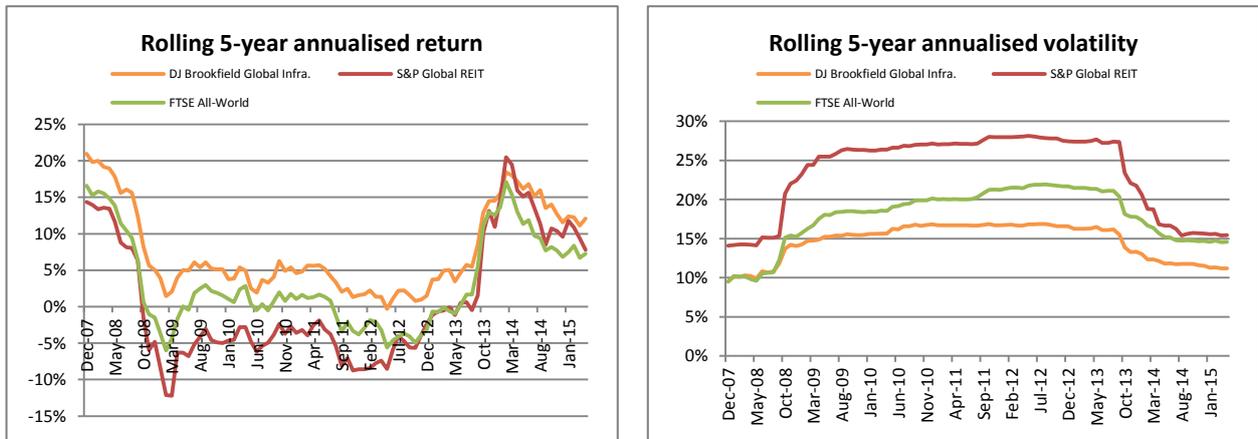


Figure 1 (Source: Bloomberg)

Figure 1 compares the return and volatility of the Dow Jones Brookfield Global Infrastructure Index against the S&P Global REIT index and the FTSE All-World index for data between January 2003 and April 2015. Dow Jones Brookfield Global Infrastructure is chosen because its selective constituent process makes the index more representative of the “infrastructure investment performance”. Throughout this period, the index has demonstrated a higher rolling return and lower volatility as compared to the other two, although the excess return has been narrowing since late 2013.

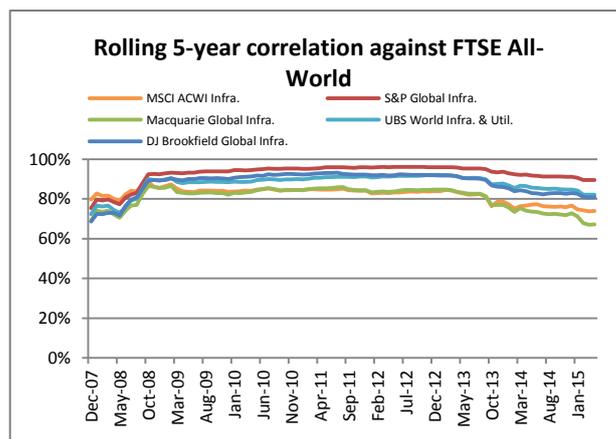
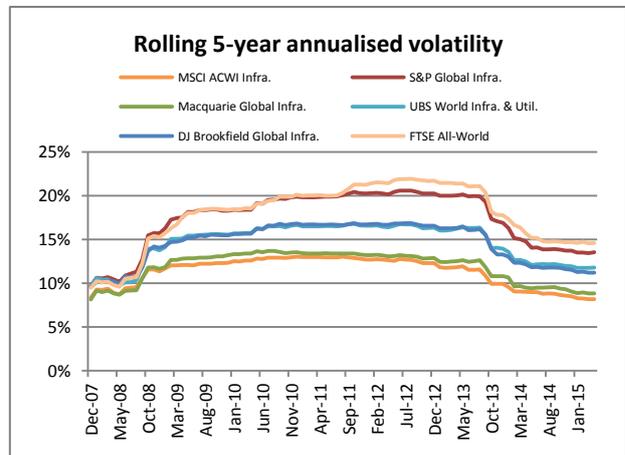
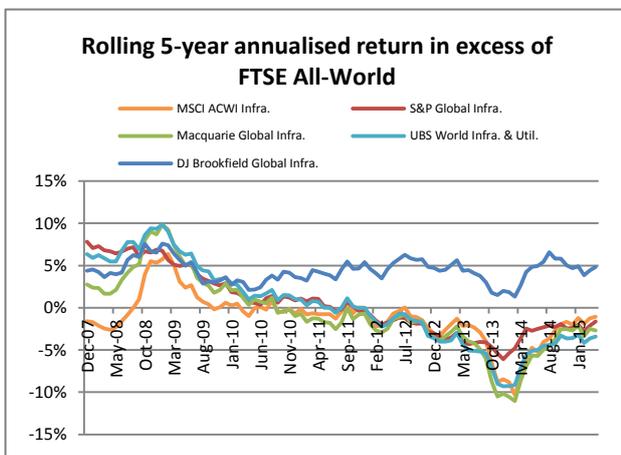


Figure 2 (Source: Bloomberg)

Comparing all the major infrastructure indices against each other in the same period (in Figure 2), it can be seen that only Dow Jones Brookfield Global Infrastructure consistently outperformed FTSE All-World, while other indices registered negative excess return since 2010. These indices showed lower volatility as compared to FTSE All-World, except perhaps for S&P Global Infrastructure. It is worth noting that all five infrastructure indices actually displayed negative skewness and fat tails – the skewness ranges from -0.88 and -1.12 while the kurtosis ranges from 1.5 to 2.8 in the same period. Also the indices provide only limited diversification benefit, where their correlations against FTSE All-World fall within 80%-100% range (albeit these are beginning to fall in recent months). These figures suggest that the nature of these companies' performance may not mimic the performance that we would have expected from direct infrastructure investment.

We have also assessed the historic volatility using a Garch process (see Figure 3 below), to give an indication of the variation from month to month. This has been done for the five Infrastructure indices of Figure 2. For the three indices with higher overall volatility shown in red, dark blue and light blue, volatility spikes in 2008. This is especially true for the S&P Global Infrastructure index which reached a peak of 33%pa. For the two with lower overall volatility, not only was volatility lower but it was also flatter and more stable. The volatility of the MSCI ACWI Infrastructure index stayed within the low and narrow band from 10%pa to 16%pa. The fact that these two latter indices did not spike to the same extent as the others during the financial crisis of 2008 is perhaps somewhat surprising at first sight. (The assumptions underlying the fitted volatilities are a Garch model with Normal residuals.)

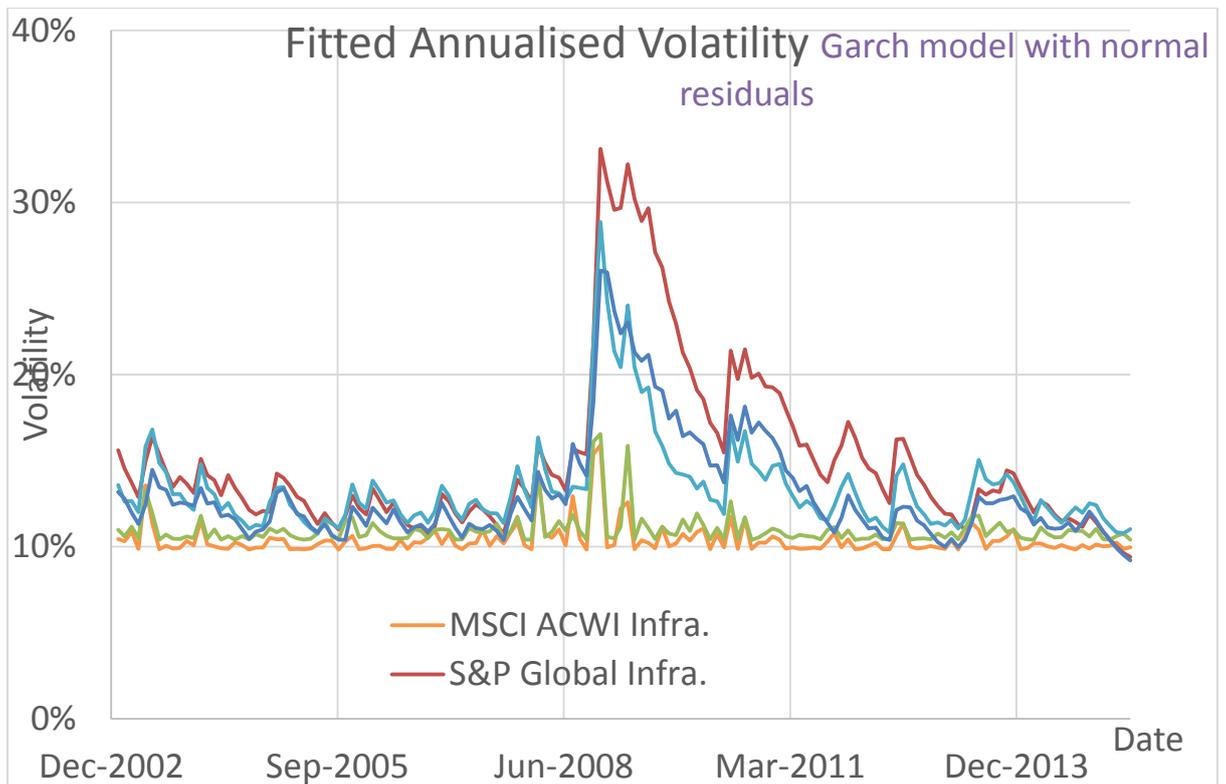


Figure 3 – Annualised volatility of infrastructure indices. Note: the colours are consistent with those shown in Figure 2 for the same indices.

In terms of dividend yield, infrastructure indices have a higher dividend yield as compared to global equity and REIT indices. In January 2013 – April 2015 (April 2013 – April 2015 for Dow Jones Brookfield Global Infrastructure), the 12-month dividend yield averaged 4.04% for S&P Global Infrastructure, 4.09% for Macquarie Global Infrastructure and 3.28% for Dow Jones Brookfield Global Infrastructure. For comparison, average 12-month dividend yields for the MSCI ACWI and S&P Global REIT indices were 2.55% and 4.01% respectively. This is rather expected given the nature of low growth stocks which would offer higher dividend yield.

The difference in the performance of infrastructure and equity indices during periods of high inflation and low inflation are analysed in Figure 4 below. Inflation is measured by monthly changes in the Consumer Price Index of the respective region, from January 2004 to March 2015. Months where the monthly inflation is above the median inflation are categorised as “high inflation” and vice versa. The average for the monthly returns of the infrastructure index is compared to that of the equity index for each inflation period. The charts below show that in high-inflation periods, the infrastructure index outperformed the equity index, although this was more significant in the US than in Europe. (Note: Macquarie Global Infrastructure North America is chosen to represent the US market because of its longer available history. US constituents are dominant in the index, so the index should fairly represent the performance of US infrastructure companies.) Numerous (and more robust) attempts have been made to assess the inflation protection that listed infrastructure equities could provide and this is merely a simple analysis to observe how the returns behave in different inflation periods.

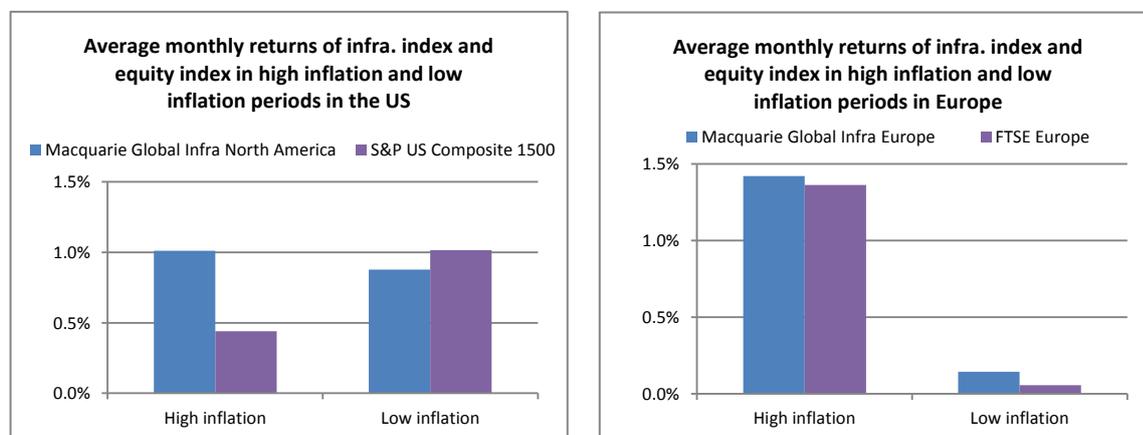


Figure 4 (Source: Bloomberg)

38. Investment companies

These companies are closed-end investment companies which invest in equities and/or subordinated debts issued by infrastructure SPVs. The proceeds from the equity and debt issuance are used to finance the construction and/or operation of infrastructure projects commissioned by the public sector.

The advantages of accessing the asset class through an investment manager are: 1) managers are normally specialized and have access to resources and expertise otherwise unavailable to other investors; 2) as investment managers pool funds, investors can get access to both larger and smaller projects, and benefit from a diversified portfolio. These advantages are particularly attractive to smaller institutional investors, which may lack resources in having their own in-house investment specialist to carry out the necessary research analysis. However, investors in pooled funds may have limited control over the choice of the underlying infrastructure exposure.

Closed-end investment companies listed on the London Stock Exchange are:

Company	Market focus	Geographic focus	Market cap¹ (GBP mn)
3i Infrastructure (3IN)	Core economic infrastructure (utilities and transportation sectors), social infrastructure, primary PPP	Europe and India	1,390
Bilfinger Berger Global Infrastructure (BBGI)	PPP/PFI projects	Europe, North America, Australia and New Zealand	530
HICL Infrastructure (HICL)	Operational social and transportation infrastructure (PPP/PFI)	UK, Europe, North America and Australasia	2,010
International Public Partnerships (INPP)	Social infrastructure	UK, Europe, North America and Australasia	1,160
John Laing Infrastructure (JLIF)	Equity and subordinated debt of PPP projects	UK, Continental Europe and North America	1,030
GCP Infrastructure (GCP)	Infrastructure debt	UK	609
Sequoia Economic Infrastructure Income (SEQI)	Senior and subordinated debt of economic infrastructure	Europe, US, Australia and New Zealand	159
Vietnam Infrastructure (VNI)	Shares of companies involving in infrastructure, or infrastructure funds	Vietnam, China, Laos and Cambodia	172

Source: Company websites

¹ As of March 19th, 2015

Fees, dividend policy and hurdle rates are as follows:

Company	Ongoing charge ratio	Dividend policy targets	Investment projects' hurdle rates
3i	1.45%	5.5% yield	IRR 7-8% net of expenses
BBGI	0.98%	5.5% yield	7 – 8%
HICL	1.12%	4.55% yield	7 – 8%
INPP	1.29%	Long-term inflation expectation (2.5%)	8 – 9%
JLIF	1.35%	6% yield on IPO issue price	Weighted average rate, based on government bonds. This was 8.19% for 2014, based on 3.46% risk-free rate + 4.73% risk premium.
GCP Infrastructure	N/A	Up to 8 pence per share (e.g. 6.79% as of April 24 th , 2015)	N/A. Minimum reported yield on the investment portfolio is 9%
Sequoia Economic Infrastructure Income	N/A	5% in the first year of operation (2015) and 6% thereafter	N/A. Typical return quoted ranges from 6 to 9% as of February 2015
Vietnam Infrastructure	2.6%	N/A. 2014 dividend yield was 5.6%	N/A

Source: factsheets and annual reports 2014

Discount rates used to value the investment companies' projects reflect these factors:

- The difference between the discount rate and the risk-free rate gives the implied risk premium of the projects.
- The risk premium reflects the concession life of the projects (the longer concession life i.e. less mature projects, the higher risk premium), construction risk (if the project is still at the construction stage), inflation sensitivity, and the level of gearing within the SPV of the infrastructure projects
- Different ranges of discount rates for different types of infrastructure assets: operational assets, assets going into operation and assets under construction, across all investment companies

The following figures for the volatility and return of five of these investment companies are interesting but of limited use because they relate only to relatively short periods of time and cannot therefore be taken as representative of what might be expected over longer periods at different phases of the economic cycle.

Company	3i	BBGI	HICL	INPP	JLIF
Period	Jan'10 – Dec'14	Jan'12 – Dec'14	Jan'10 – Dec'14	Jan'10 – Dec'14	Jan'11 – Dec'14
Total return / excess return over FTSE all-share (%) ²	14.1 / 5	11.6 / 0.7	12 / 2.9	8.6 / -0.5	9.3 / - 2.2
Annualised price volatility / excess over FTSE all-share volatility (%)	8.3 / -4.1	7.6 / -2.8	6.8 / -5.6	6.1 / -6.3	6.4 / -4.8
Return per unit of volatility / excess over FTSE all-share	1.7 / 0.97	1.52 / 0.48	1.76 / 1.03	1.41 / 0.67	1.45 / 0.42
Correlation with FTSE All Share	0.10	0.30	-0.03	0.15	0.14

² Total return includes price and dividend return. All dividends are reinvested in stock.

39. Summary

The above analysis suggests that listed infrastructure equities have liquidity advantages over direct investment in infrastructure, but they do not offer much in the way of diversification or in most cases outperformance, compared with equities as a whole, though there is some evidence that they have lower volatility.

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Overall portfolio construction

41. Once an institution has taken a decision in principle to invest in infrastructure, the question will arise as to how much to commit to this class, as well as the split between bonds and equity. Amendments to the institution's risk appetite statement may be needed. If the decision is to invest only in infrastructure bonds, the bonds will be little different from those of other organisations with the same credit rating, though they may differ in terms of cash-flow profile and recovery rate. However, unless there is a full Government guarantee of the bonds, consideration will have to be given to any big uncertainties to which the infrastructure itself is exposed (see paragraphs 12-22) and which may not have been given as much weight, in the relevant rating criteria used to assess the credit quality of the asset and generate the credit rating, as the investor might attribute to them. Such uncertainties, however remote they may appear today, may cause an investor to hesitate before committing too high a proportion of its portfolio to infrastructure bonds, even if they offer a marginally higher return than Government bonds. In cases where the credit rating is less than prime, the proportion of the portfolio to be invested in such bonds will have to be considered in the same way as corporate bonds. It will need to be remembered that any apparent liquidity might dry up if the underlying infrastructure asset is itself seen to be in trouble.

42. Different considerations arise in the case of direct ownership of infrastructure assets, either freehold or leasehold, where the risks and potential returns will be much higher, particularly if there are construction and forecasting risks. The investor will need to make a judgement about the risk-reward balance on each individual asset and whether the investment is likely to be worthwhile. A good spread of assets to achieve diversification of risk between different assets is desirable, and in the case of a smaller investor this can probably best be achieved by investing

through a platform in partnership with other investors, sharing the cost of due diligence with them. Only the largest institutions are likely to be able to afford to build up a diverse portfolio of infrastructure investments on their own. In those cases where institutions already invest in commercial properties, it may make sense to reclassify them as infrastructure and consider them as being in the same category as the new forms of infrastructure now being introduced to the portfolio.

43. One of the considerations which usually has to be taken into account when deciding on the allocations between different classes of investment is the extent to which the returns of the various classes will be correlated with each other. This is particularly important in those cases where an annual performance report is made to members or whether the assets are valued at market value for consolidation into the accounts of a sponsoring company. Just like commercial property, any directly-owned infrastructure assets will need to be revalued from time to time for such purposes, but capital values are likely to lag behind equities when values move upwards or downwards with the economic cycle. This stability may be more apparent than real, but nevertheless could be seen as an attraction of infrastructure.

44. Another decision which will need to be made when going into direct ownership is whether there are any preferences between different classes of infrastructure, for example are energy investments to be preferred over transport, student accommodation or “buy to let”, or is a good spread over all classes desired to achieve greater diversification of risk? Is the investment to be restricted to a long lease of infrastructure which has already been developed or is it to extend to green field sites on which the assets are to be constructed? Will overseas assets be considered?

45. In deciding on the prospective return which would be acceptable from direct ownership of infrastructure, we suggest that where the risks are considered to be broadly similar to those of commercial property, the investor might well be looking for a similar return. This might be enhanced in cases where there is less liquidity. At the end of 2014 the running yields on UK prime commercial properties averaged 5.6% per annum [Source: CBRE Market View, UK Prime Rent and Yield, Q4 2014]. The yields on good secondary properties would have been higher than this, though with greater risk. An analysis of the prospects for long-lease property by M&G Investments [*Pensions Age*, April 2015, page 63] over the period 2014-2048 indicated that the return to an investor would be 4.8% per annum, even if the investment had to be written off at the end of the period. If the property value remained unchanged, the return would be 6.9% per annum. It should be borne in mind that these figures might be somewhat enhanced in due course, due to rent increases.

46. Using the returns on commercial property as a benchmark, we can start to make an estimate of the kind of return we might want to get from a long lease on an infrastructure investment which is thought to bear a similar degree of risk. Perhaps the purchaser of the lease of a UK infrastructure asset which has already been constructed and has a good-quality income stream might therefore want to get an initial yield of around 6 per cent per annum, assuming that the asset reverts to the public sector at the end of 30 years with no return of capital to the investor. If the income stream is less certain than a prime property rent, or if the asset has yet to be constructed, the prospective yield would have to be higher, to allow for the substantial extra risks involved. If the income stream is linked to inflation, a slightly lower initial yield might be contemplated.

47. In the case of infrastructure bonds with a strong public sector guarantee, the return required will be significantly lower, reflecting the lower risk and the eventual capital repayment. However, as indicated earlier, there will still usually be a degree of risk and lower liquidity than in the case of government bonds, necessitating a higher rate of return than on those bonds, to compensate.

48. In the case of equity infrastructure investments as part of the capital structure of special purpose vehicles, the projected rates of return will have to be treated with considerable caution, given all the risks involved. However, it may be that a carefully selected portfolio of such investments, chosen to spread the risks as far as possible and with plenty of upside potential for extra development, will give good returns in the long run. At the very least it will introduce a degree of diversification into the overall portfolio.

Practical issues

49. There are many practical issues for an investor in infrastructure, including the need to find suitable investments with the right durations, identify the risks, exercise due diligence, monitor the investment as time goes on, etc. Thought will have to be given to the choice of route: bonds, listed companies, infrastructure funds, direct ownership, or participation in equity. A policy will have to be established on the classes and locations of the infrastructure which will be considered. The work involved in direct ownership will often be beyond the capabilities of an individual investor, and a partnership with others may be necessary, perhaps via a platform. The investor's own regulatory issues will need to be considered. As part of the due diligence process for direct ownership, it might be worthwhile to build a model, showing the income streams which are expected and then testing the model to see what might happen in various future scenarios. In cases where the asset has yet to be constructed, the investor may wish to insist on the use of a risk management methodology such as RAMP.

50. One of the most difficult areas at present is the finding of suitable investment opportunities. In the case of infrastructure bonds there is such strong demand that in some cases yields are little higher than those on gilts, and it is perhaps questionable whether they provide an adequate return to the investor. In the case of direct ownership, some institutions have started to develop relationships with public officials, so that they can hear of projects at an early stage. This also helps the officials, since they will have a better idea, before they have done a great deal of work, on whether their project is likely to attract investment. Such liaison between officials and investors is likely to continue if the UK continues the process of devolution in ways which enable local authorities to develop and seek funding for their own projects without the necessity to seek Government approval for each one. This could lead to a multitude of smaller projects becoming available for investment. In cases where the asset has yet to be constructed, we may see partnerships developing between developers, who will bear the construction and forecasting risks, and long-term investors who will buy out the completed asset.

51. Once the investment has been made, there may be a need to continue to keep a careful watch on it, and this will take suitably experienced resources. Sometimes there may be a need to vary the terms initially agreed, for example.

Possible future work

52. The working party has not yet decided on whether it wishes to study other aspects of infrastructure investment, and would welcome views from the readers of this paper. Some of the areas which could be considered for research are:

- questions of sustainability, having regard to climate change and other major uncertainties, both from the perspective of risk as well as the opportunity and duty to be constructive in helping to enable the construction of resilient and adaptable infrastructure;
- a study of whether particular avenues of direct ownership are likely to be especially attractive for investors;
- a study of the extent to which institutions might be able to participate in infrastructure investment in underdeveloped countries, having regard to problems such as corruption, lack of financial structures, extreme political risk, etc. Are there structures which could be developed that would enable some of these risks to be minimised and enable institutions to invest?

Further reading

53. We recommend a useful paper prepared recently by an IFoA working party headed by Gareth Mee: *Non-traditional investments – key considerations for insurers*, January 2015. [available on-line at <http://www.actuaries.org.uk/research-and-resources/documents/non-traditional-investments-key-considerations-insurers-long-versio>]. Although the paper deals with a variety of non-traditional investments, there are some excellent sections on infrastructure, including links to online case studies.

The RAMP methodology referred to in paragraphs 20 and 49 is set out in a guide published by ICE Publishing, Institution of Civil Engineers, 3rd edition, 2014. It was developed by a working party of actuaries and civil engineers, and is used by London's Crossrail as a basis for its own risk-management system.

54. Here are some useful web-sites:

<http://www.oecd.org/pensions/private-pensions/institutionalinvestorsandlong-terminvestment.htm>

<http://www.worldbank.org/en/news/press-release/2014/10/09/world-bank-group-launches-new-global-infrastructure-facility>

<http://www.oliverwyman.com/insights/publications/2012/apr/pension-funds-investment-in-infrastructure.html#.VSfOAFDE12s>

<http://www.weforum.org/reports/infrastructure-investment-policy-blueprint>

http://www.iiasa.ac.at/web/home/research/researchPrograms/RiskPolicyandVulnerability/Flood_Resilience.en.html

<http://www.oliverwyman.com/insights/publications/2012/mar/strategic-transport-infrastructure-needs-to-2030.html#.VSfPRvDE12s>

<http://www.oliverwyman.com/insights/publications/2014/mar/oecd-institutional-investors-and-infrastructure-financing.html#.VSfPZvDE12s>

<http://www.oliverwyman.com/insights/publications/2014/jan/infrastructure-development-davos.html#.VSfPjvDE12s>

<http://www.nerc.ac.uk/innovation/activities/infrastructure/envrisks/>

Conclusion

55. It is clear that the main obstacle which is preventing institutions from investing more money in infrastructure in developed countries at present is a shortage of suitable investments. Yields on infrastructure bonds are currently so low that some may question whether the return is high enough to justify investing in them, though they may still be useful for insurance companies and pension schemes looking to match long-term liabilities. There is also a lack of willingness to invest in any form of infrastructure on the part of some institutions, because they do not have an adequate understanding of the risks involved, and hopefully this paper may start to fill in some of the information they need. Much of the infrastructure investment which the world requires over the next 15-20 years will be in countries which are still developing, and it is here that some of the biggest returns may be achievable for those investors who are prepared to take on the formidable risks involved and make selective investments after careful due diligence

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